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(54) Title: CHOLESTEROL LOWERING COMPOSITION

(57) Abstract

The present invention concerns a composition containing a cholesterol lowering component such as β-sitosterol and/or β-sitostanol in a monomolecular, low associated or "cluster" form, where a melt and/or solution of the said components are distributed, immobilised and stabilised in a matrix; food containing such a composition and a method of preparing this composition.

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Cholesterol lowering composition.

Technical field.

The present application describes a composition containing a cholesterol lowering component, as β-sitosterol and /or β-sitostanol, food containing such a composition, and a method to prepare the composition.

Background of the invention.

A daily intake of some compounds similar to cholesterol has been shown to have a cholesterol lowering effect. Specifically this is true for β-sitosterol and the hydrogenated form β-sitostanol (1-5).

Under β-sitosterol is also understood mixtures containing β-sitosterol, β-sitostanol and campesterol isolated from for instance soy or tall oil. Under β-sitostanol is also understood fully or partly hydrogenated β-sitosterol as above.

It is known that sterols and stanols are compounds with a very low solubility. They also crystallise easily. Several researchers have pointed at the importance that β-sitosterol and β-sitostanol must be adminstered in a formulation giving the optimal cholesterol lowering effect in the body. In a crystalline form even after efficient micronisation and/or in suspension the effect is lower than for solutions or emulsions (6-15). Hitherto described solutions and emulsions, however, have the disadvantage being too dilute to allow a simple intake in doses nescessary of about 1.5 g/day (16-18).

The solubility in fat of sterols and stanols, both being alcohols, can be increased considerably by esterification with fatty acids. These esters are hydrolysed in the stomach and sterols and stanols are liberated as the initial alcohols in a concentration low enough not to allow recrystallisation. The cholesterol lowering effect in the gut is thus improved (16-20).

We have now shown that it is not necessary to esterify sterols and stanols to be able to distribute them in a sufficiently high concentration in a monomolecular, low associated or "cluster form" to reach necessary daily doses.

Description of the invention

In the present invention we show how sterols and stanols by simple methods can be stabilised in monomolecular, low associated or "cluster" form by distributing and immobilising a solution of high concentration or a melt of sterols and/or stanols in a matrix.

Sterols and/or stanols are initially dissolved in an organic phase, for instance in mono-, di- or triglycerides, fatty acids, lecithin and others preferentially at an elevated temperature. The solution is then mixed with a stabilising phase, matrix, containing a high molecular material e.g. gelatin, casein, starch syrup, pectin, ethylhydroxyethylcellulose or other at an elevated temperature. The mixture is then allowed to set to a solid, rubberlike or highly viscous mass. The stabilising phase can also be based on solvents being solid at room temperature.

An alternative way to make the composition is to foam a solution of the sterols and /or stanols containing a solvent solid at room temperature possibly in the presence of a foam building component under rapid cooling. The surface of sterols and/or stanols accessible to the stomach thus becomes extremely large. Foaming can be done in different known ways. Some percent of ethanol can be added to the sterols and/or stanols, the mixture is melted at elevated temperatures, the alcohol evaporated in vacuo under formation of foam.

The solutions described above can also be mixed into different food e.g. chocolate, dough/bread, jelly, mashed potatoes, butter/margarine, youghurt and others or be encapsulated or mixed into tablets.

The special characteristics of the present innovation are also shown by the enclosed claims.

The present innovation is described below by not limiting examples, If not otherwise stated the given values are in weight or weight %.

Example 1.

30 g of β-sitostanol were dissolved in 70 g of a monoglyceride such as Dimodan RT at 90° C on a hot water bath and stirred till the stanol was completely dissolved. The 30% solution can be used directly or stored as a prefabricate after cooling as a homogenous mass.
20 g of the solution obtained were slowly added under intensive stirring to 80 g of a 35% solution of gelatin and agar 10:1 , starch syrop, sugar and aroma in water placed on a hot water bath at 65 °C.
The liquid highly viscous composition was immediately cast in small forms, where it solidified as a gel containing β-sitostanol in a stabilised monomolecular or low associated form.
The composition can be used as such or be mixed into food and/or be foamed, encapsulated or made into tablets.

Example 2.

10 g of β-sitostanol were dissolved in 10 g of Dimodan RT at 120 °C on an oil bath. The solution was carefully under intensives stirring added to 80 g of a 30% solution of gelatin in water, also containing sugar and aroma, placed on a water bath of 85 °C. The homogenous stabilised composition was then treated as in example 1.

Example 3.

10 g of β-sitosterol were dissolved in 10 g of rapeseed oil at 120 °C on an oil bath. The solution was carefully under intensive continous stirring added to 30 g of a 30% solution of gelatin in water, containing sugar and aroma, placed on a hot water bath of 95 °C.
The homogenous stabilised composition was then treated as in example 1.

Example 4.

10 g of β-sitostanol were dissolved in 10 g of rapeseed oil at at 130 °C on an oil bath. The solution was carefully added under intensive continous stirring to 50 g of a 30% solution of gelatin in water, containing sugar and aroma, placed on a hot oil bath of 110 °C.
The homogenised stabilised composition was then treated as in example 1.

Example 5.

10 g of β-sitostanol were dissolved in 10 g of Dimodan RT at 120 °C on an oil bath. In another flask 80 g of chocolatemass were melted on the same bath. The 50% solution of β-sitostanol was slowly added under continous stirring to the chocolate. The composition was directly cast in forms, where it solidified and could be used as such or mixed into food or tableted, encapsulated or foamed.

Example 6.

10 g of β-sitostanol were dissolved in 10 g of rapeseed oil at 130 °C on an oil bath. In another flask 40 g of chocolatemass were melted at 110 °C on an oil bath. The 50% solution of β-sitostanol was added under continous stirring to the chocolate.
The composition was directly cast in forms where it solidified and can be used as such or mixed inte food or be tabletted, encapsulated or foamed.

Example 7.

30 g of β-sitostanol were dissolved in 30 g stearic acid at 130 °C on an oil bath. A few drops of ethanol were added under intensive stirring and the composition was placed under vacuum. The mass bubbled up and was allowed to solidify as a foamed material that could be mixed for instance flour, dough, mashed potatoes or other food material, encapsulated or tabletted. Alternatively the composition can be directly cooled and used as such, mixed into food, encapsulated or tabletted.

Example 8.

2.5 g of β-sitosterol were dissolved in 2.5 g of Dimodan ML at 80 °C. The solution was added to 1 litre of a 3% solution of sodium caseinate at 60-80 °C under strong stirring with a Turrax. After 5 minutes the emulsion was cooled to 20 °C and can be

used as a beverage. The emulsion can be kept in a fridge during at least 3 days. The same result is obtained using milk.

Example 9.

12.5 g of β-sitosterol were dissolved in 25 g of Dimodan ML at 60 °C. The solution was added to 80 g of melted margarine and mixed with 125 g of flour, 175 g of oatflakes, 2.5 g of baking powder and 80 g of sugar to a dough. The mixture was baked into 25 cakes of 18-20 g each containing 0.5 g of β-sitosterol.

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20 A substance for lowering high cholesterol level in serum and method for preparing the same. Patent C07J 9/00, A61K 31/575

Claims

1. Composition containing a cholesterol lowering component such as β-sitosterol and/or β-sitostanol in a monomolecular, low associated or "cluster" form, in which a melt and/or solution of said compounds is distributed, immobilised and stabilised in a matrix.

2. Composition as in claim 1, in which the matrix is based on a solid or highly viscous material such as gelatin, caseine, pectin, agar, starch, starch syrop, ethylhydroxyethyl cellulose, stearic acid, chocolate mass and similar or a mixture of two or more of these.
3. Composition as in claim 1, in which the melt and/or solution is in an organic phase.
4. Composition as in one or more of preceeding claims, in which the melt and/or solution is in an organic phase such as a monoglyceride, diglyceride, triglyceride,fatty acid, alcohol, lecithin and similar or a mixture of two or more of these.
5. Composition as in one or more of preceeding claims, in which the cholesterol lowering component includes β-sitosterol.
6. Composition as in one or more of preceeding claims,in which the cholesterol lowering component includes β-sitostanol.
7. Composition as in one or more of preceeding claims, in which the organic phase contains a monoglyceride such as Dimodan RT.
8. Composition as in one or more of preceeding claims, in which the matrix is based on a 10-50% solution of gelatin in water and if chosen taste and aroma compounds.
9. Composition as in claim 1, in which the matrix at room temperature is a solid solvent such as stearic acid and/or a foam building agent.
10. Composition as in claim 1, in which the cholesterol lowering agent is 1-99% of the organic phase for instance Dimodan RT.
11. Food containing a composition as in one or more of claims 1-10, in an amount to ensure a cholesterol lowering effect.
12. Food as in claim 11 being butter, butter substitute, margarine, chocolate, jelly, bread, mashed potaoes, yoghurt, soup and similar.
13. Food as in claims 11-12, in which mentioned composition is included in the food in up to 60 %.
14. Procedure to manufacture a composition as in any of the claims 1-10, in which a cholesterol lowering component is melted or dissolved in an organic phase under elevated temperature, and the obtained melt or solution, before crystallising or associating in other ways, is distributed in a matrix so that mentioned component is stabilised mainly in monomolecular or low associated or "cluster" form.
15. Procedure as in claim 14 to produce a composition as in claim 9 in which the cholesterol lowering component is dissolved at an elevated temperature in a solvent solid at room temperature and is cooled or foamed under fast cooling.
16. Procedure as in claim 14 in which the elevated temperature preferably is up to 160 °C.

17. Procedure as in claim 14 in which the elevated temperature preferaby is in the interval about 60 °C to 150 °C.
18. Capsule, tablet or foam containing a composition as in claims 1-13.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 99/00721

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A61K 9/14, A61K 31/575
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1365661 A (ROELOF WILKE LIEBENBERG), 4 Sept 1974 (04.09.74), column 2, line 50 - line 53, examples 1 and 2 --	1-18
X	EP 0357967 A1 (ROECAR HOLDINGS (NETHERLANDS ANTILLES)N.V.), 14 March 1990 (14.03.90), page 1, left column, lines 19-26, claim 1 and 2 --	1-18
X	DE 4038385 A1 (HARMSEN H., DR. ET AL), 4 June 1992 (04.06.92) --	1-18

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	File WPI, Derwent accession no. 87-196297, NISSHIN OIL MILLS LTD: "Instant powder compsns with improved dispersibility - contg. lecithin and sterol (deriv.);" & JP,A,62126966, 870609 DW8728	1-18

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INTERNATIONAL SEARCH REPORT

Information on patent family members

30/08/99

International application No.
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